June 17, 1958 L. A. OTTENBERG ET AL 2,839,677

AUTO ALARM SYSTEM

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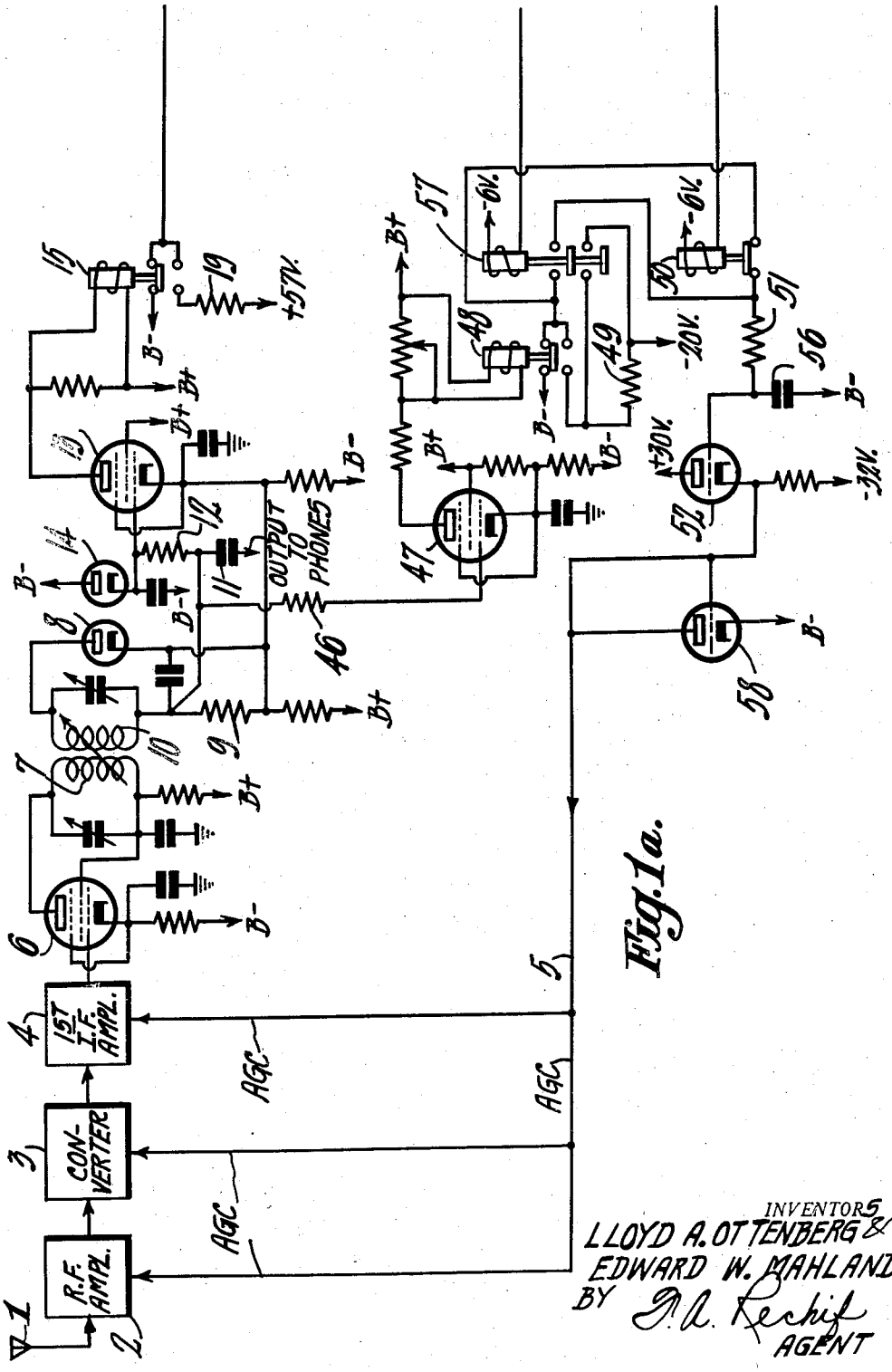

Fig. 1a.

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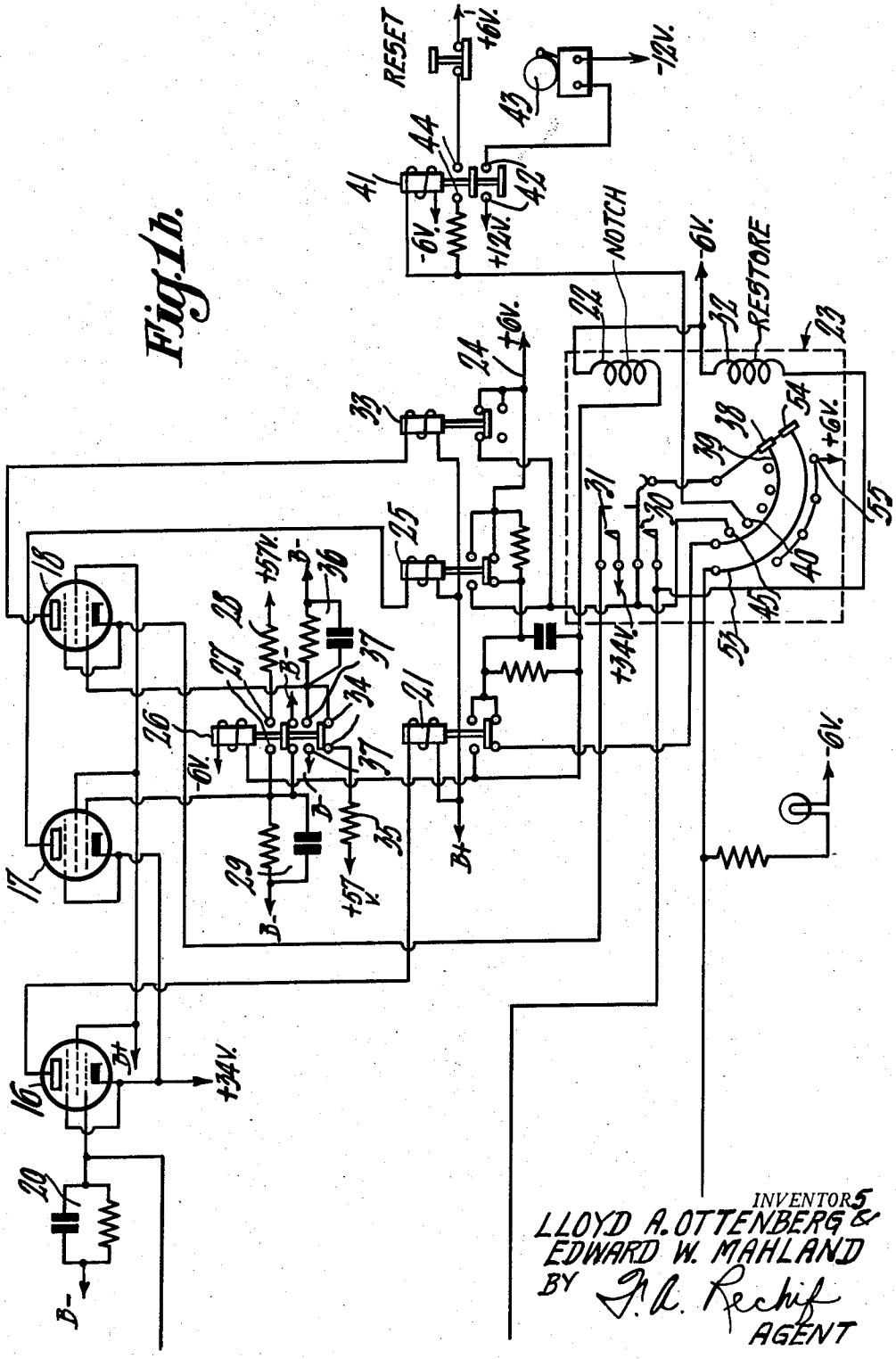
Fig. 1b.



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AUTO ALARM SYSTEM

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This invention relates to a radio receiver of the auto alarm type, and more particularly to such a receiver provided with an arrangement for automatically adjusting the sensitivity of the receiver in accordance with the prevailing average interference level.

The fundamental purpose of an auto alarm type radio receiver is to stand watch on the 500-kc. internationally assigned distress frequency at all times when the radio operator (either on ship or ashore) is not on duty. The International auto alarm signal consists of a series of dashes each four seconds in length, separated by spaces having a duration of one second. Twelve such dashes and spaces transmitted in one minute precede the International distress signal, SOS, after which the desired text may be transmitted. Auto alarms designed to meet the requirements of the Federal Communications Commission are arranged to actuate warning bells when four correct dashes and spaces have been received.

Automatic alarm receivers cannot distinguish between interference and an alarm signal. For the purposes of the present discussion, interference may be defined as noise (such as static) and/or any signal other than an alarm signal. To provide a modicum of selectivity of response as between interference and alarm signals, prior auto alarm receivers were generally provided with a sensitivity control which was used to manually adjust the sensitivity of the receiver to the proper level as determined by the amount of interference present. However, this control requires constant manual adjustment due to changes in interference, since if left alone it will become set incorrectly as time passes and an alarm signal may be lost. For example, if the receiver sensitivity becomes set too high, any continuous interference stronger than the sensitivity setting of the receiver will "lock up" the alarm, so that no alarm signal can be received; in this case, an alarm signal of greater strength than the interference will not actuate the warning bells, and the interference itself may actuate the warning bells and give a false distress warning. On the other hand, if the receiver sensitivity becomes set too low, a weak alarm signal will be lost.

An object of this invention is to provide an arrangement for automatically adjusting the sensitivity of an auto alarm receiver to the prevailing average interference level.

Another object is to provide a novel auto alarm receiver which will operate at all times to receive standard alarm signals through interference equal to or weaker than the alarm signal.

The objects of this invention are accomplished, briefly, in the following manner: The interference level in the receiver is used to actuate controlling relays which control the charge and discharge time of an RC network, the voltage obtained from the RC network being used as an automatic gain control (AGC) bias for the receiver. The controlling relay circuit automatically discriminates between interference and an alarm signal, provided the alarm signal is equal to or greater than the interference

level, with the result that with only interference present in the receiver the sensitivity of the receiver can be reduced approximately 100 db in about ten seconds, but with an alarm signal present the sensitivity of the receiver will be reduced only about 1 db during the reception of the alarm signal.

The foregoing and other objects of the invention will be better understood from the following description of an exemplification thereof, reference being had to the accompanying drawings, wherein the single Figure 1 (separated into Fig. 1*a* and Fig. 1*b* on separate sheets) is a schematic diagram of an auto alarm receiver according to this invention.

Referring to the drawings, distress signals received on an antenna **1** are amplified in a radio frequency amplifier **2** tuned to 500 kc. and are then converted in a converter stage **3** (which includes a crystal oscillator operating at 600 kc.) to an intermediate frequency (IF) of say 1100 kc. for amplification in a first I. F. amplifier **4** which is tuned to 1100 kc. The R. F. amplifier **2**, the converter **3** and the first I. F. amplifier **4** are all evacuated electron discharge device circuits. The discharge devices in these circuits are all of types the gains of which may be adjusted or controlled by variation of the bias applied to certain grids thereof. The connections for controlling the gains of these three stages are represented by the leads labeled AGC, one to each of the stages **2**, **3** and **4** and all connected to a common AGC lead **5** to be referred to more in detail hereinafter.

The output of amplifier **4** is applied to the control grid of an electron discharge device **6** connected as a second I. F. amplifier also tuned to pass 1100 kc. The device **6** is preferably of the same type as those used in stages **2** and **4**. The amplified I. F. signal appears in the primary **7** of an I. F. transformer connected to the anode of tube **6** and is coupled therefrom to a diode detector **8**, wherein it is detected to produce a voltage which appears across a resistor **9** connected between the cathode of diode **8** and the secondary **10** of the I. F. transformer previously referred to. The intelligence appearing across resistor **9** may be taken off through a capacitor **11** for utilization in suitable phones (not shown).

The D. C. voltage from the diode stage **8** (across resistor **9**) is applied as a negative voltage through a resistor **12** to the control grid of an electron discharge device **13** which serves as a signal relay amplifier tube. The cathode of a diode rectifier **14** (which is preferably in the same envelope with diode **8**) is connected to this same control grid, while the anode of rectifier **14** is connected to the negative terminal of the unidirectional potential power supply. Rectifier **14** serves as a clamp tube, to prevent excessive negative bias from being applied to the signal relay amplifier tube **13**. Rectifier **14** may be omitted if desired. The coil of a signal relay **15** is connected into the anode circuit of the signal relay amplifier tube **13**. Any incoming signal between 100 microvolts and one volt and within the signal frequency band of 492–508 kc., will actuate the armature of relay **15**.

In the drawings, all of the relays are illustrated in the positions assumed by them under "no signal, no interference" conditions in the receiver, whether such positions are deenergized or energized for any particular relay.

The relay amplifier tube **13**, in the absence of signals, has a steady current flowing through its anode circuit, resulting in the energization of relay **15** to the position illustrated. This current is reduced upon the receipt of a signal to deenergize relay **15**, since such signal results in the application of a negative voltage to the control grid of tube **13**, as previously described.

An auto alarm selector, to operate efficiently with the International auto alarm signal, and to reject other or interfering signals, must perform three main functions. First, it should reject signals having a duration less than approximately 4.0 seconds. Secondly, it should reject signals having a duration greater than approximately 6.0 seconds. Thirdly, it should recognize spaces between signals provided these spaces do not exceed 1.5 seconds. In the auto alarm to be described, three selector tubes **16**, **17** and **18**, with appropriate relays, are used.

As previously described, incoming signals of the correct frequency to be passed through the various stages **2**, **3**, **4** and **6** will be detected by detector **8** to produce a negative voltage which is applied to the control grid of tube **13**, lowering the anode current in this tube and deenergizing relay **15**. When relay **15** is deenergized, a positive voltage is applied from a positive potential source +57 v. through a resistor **19** and the now-closed lower pair of contacts of relay **15** (Fig. 1*a*), to the control grid of the first selector tube **16** (Fig. 1*b*), by way of a suitable RC network **20**. Network **20** causes a time delay to that no current will flow in the anode circuit of tube **16** until approximately 4.0 seconds have elapsed. It may be noted that in the absence of any signals or interference, relay **15** is energized and a zero potential (B—) is applied to the control grid of tube **16** through the upper pair of contacts of relay **15** and tube **16** is cut off due to the +34 v. on its cathode.

At the end of approximately 4.0 seconds of signal, anode current flows in tube **16** and this current energizes the coil of the first selector relay **21**, which coil is connected into the anode circuit of selector tube **16**. Energization of relay **21** causes opening of its lower pair of contacts and closure of its upper pair of contacts. Closure of the upper pair of contacts of relay **21** causes energization of the "notch" coil **22** of a stepping relay **23**, through a circuit which may be traced as follows: +6 v. supply lead **24**, closed lower contacts of the second selector relay **25**, closed upper contacts of relay **21** to one end of "notch" coil **22** the opposite end of which is connected to the —6 v. supply lead.

The coil of an auxiliary relay **26** is connected directly in parallel with the "notch" coil **22**, so that at the same time that coil **22** is energized, auxiliary relay **26** is energized, closing its two upper pairs of contacts and opening its two lower pairs of contacts. Closure of the upper contacts **27** applies a positive voltage from the positive source +57 v. through a resistor **28**, to the control grid of the second selector tube **17**, by way of a suitable RC network **29**. Network **29** causes a time delay such that if the incoming signal lasts for more than 6.0 seconds (the sums of the time delays provided by networks **20** and **29**) current will flow in the anode circuit of the second selector tube **17**. In the unenergized position of relay **26**, a zero potential (B—) is applied to the control grid of tube **17** through one of the lower pairs of contacts of auxiliary relay **26** and tube **17** is cut off due to the +34 volts on its cathode.

When anode current flows in tube **17**, the coil of the second selector relay **25** is energized, this coil being connected into the anode circuit of tube **17**. Energization of relay **25** causes opening of its lower pair of contacts and closure of its upper pair of contacts.

Stepping relay **23** is illustrated in its zero, starting or "home" position. The respective pairs of contacts **30** and **31** of stepping relay **23** are closed at all positions except the home position. Closure of the upper pair of contacts of relay **25** causes energization of the "restore" coil **32** of stepping relay **23**, through a circuit as follows: +6 v. lead **24**, closed upper contacts of relay **25**, closed contacts **30** (stepping relay **23** now having been stepped to its first position by energization of "notch" coil **22**) to one end of "restore" coil **32** the opposite end of which is connected to the —6 v. supply lead. When the signal ceases, under these conditions ("notch" coil **22** being unenergized as a result of deenergization of relay **21** in response to cessation of the signal, and "restore" coil **32** being energized), the stepping relay **23** returns to its zero or starting position. The stepping relay **23** does not restore to its starting position when the "restore" coil is first energized because this relay will not restore while the "notch" coil is also energized.

It may thus be seen that signals having a duration between 4.0 and 6.0 seconds will cause the stepping relay **23** to advance one position. It is now necessary to provide means for checking that the spaces between dashes (signals) are not excessive. This is accomplished by means of the third selector tube **18** and the third selector relay **33**. The upper contacts of relay **33** are connected in parallel with the upper contacts of relay **25**, so that when relay **33** is energized to close its upper contacts, the "restore" coil **32** of stepping relay **23** is energized, in the same way that coil **32** is energized when the upper pair of contacts of relay **25** are closed. Spaces are checked in the following manner. At the end of any dash lasting between 4.0 and 6.0 seconds, the coil of auxiliary relay **26** is deenergized, as a result of the removal of the negative voltage from the grid of tube **13**, with the consequent energization of relay **15**, cutoff of tube **16** and deenergization of relay **21** to open its upper pair of contacts. When relay **26** is deenergized, its contacts **34** close to apply a positive voltage from the positive source +57 v. through a resistor **35**, to the control grid of the third selector tube **18**, by way of a suitable RC network **36**. In the energized position of relay **26**, a zero potential (B—) is applied to the control grid of tube **18** through the then-closed contacts **37**. Tube **18** is then cut off due to the +34 volts on its cathode or due to an open cathode (before first dash is received).

After a time interval (approximately 5.5 seconds) beginning with the deenergization of auxiliary relay **26**, anode current begins to build up in the third selector tube **18**. However, if any subsequent dash after the first one is completed within 4.0 seconds, the auxiliary relay **26** again is energized, deenergizing or applying a zero potential (B—) to the third selector tube **18** through contacts **37**. If the second or subsequent dashes are not completed in time, anode current builds up sufficiently in tube **18** to energize the coil of the third selector relay **33**, this coil being connected into the anode circuit of tube **18**. When relay **33** is energized, its upper contacts are closed to energize the "restore" coil **32** of stepping relay **23**, thus causing the stepping relay to return to its home or starting position when the signal ceases.

As long as contacts **31** are closed (that is, whenever the stepping relay **23** is not in its home position), a +34 v. positive bias is applied through these contacts to the cathode of tube **18**, cutting it off.

The stepping relay **23** is advanced one position after 4.0 seconds of each received dash have elapsed. If the dash persists for 2.0 seconds longer the second selector relay **25** is energized, causing the stepping relay **23** to be restored to its home or zero position. If the dash is between 4.0 and 6.0 seconds long the stepping relay **23** remains on the sector corresponding to the dash counted. After 4.0 seconds of the fourth dash, the stepping relay will be advanced to the fourth position, in which movable contact **38** of this relay engages both the arcuate fixed contact **39** and the fixed contact **40**. As soon as the relay **21** is deenergized at the completion of the fourth dash and, provided the relay **25** is not energized, a circuit is completed to the coil of the bell ringing relay **41**, as follows: —6 v. lead, coil of relay **41**, contacts **40**, **38** and **39**, lower (now closed) contacts of relay **21**, lower (closed) contacts of relay **25**, +6 v. lead **24**. Contacts **42** of relay **41** are then closed, completing the circuit to audible warning indicator **43** and causing the same to sound. Relay **41**, once energized, locks itself in by means of an obvious holding circuit including its contacts **44**. If the fourth dash is too long, the relay **25** will be energized before de-

energization of relay 21, thus restoring the stepping relay 23 to its home position and preventing energization of bell ringing relay 41.

At the end of 4.0 seconds of the fifth dash, the stepping relay is advanced to the fifth position, in which movable contact 38 engages fixed contact 45, as well as contact 39. As soon as the relay 21 is deenergized at the completion of the fifth dash and, provided the relay 25 is not energized, a circuit is completed to the restore coil 32, as follows: —6 v. lead, restore coil 32, closed contacts 30, contacts 45, 38 and 39, lower (now closed) contacts of relay 21, lower (closed) contacts of relay 25, +6 v. lead 24. Then, stepping relay 23 is restored to its home or zero position.

The foregoing has described the connections and operation of the auto alarm receiver of the invention, for ringing of the bell 43 after four correct dashes and spaces. If the sensitivity of the receiver (determined principally by the gain of the three stages 2, 3 and 4) becomes set too high due to changing interference level and failure to suitably follow this up by proper manual adjustment of the sensitivity, the interference will lock up the stepping relay 23 by making the circuit to the notch coil 22, so that an alarm signal of greater strength than the interference will not actuate the warning bell 43. In addition, the interfering signal itself may actuate the bell 43 and give a false distress warning. If, on the other hand, the sensitivity becomes set to low, due to changing interference level, a weak alarm signal will be lost. According to this invention, these undesirable conditions are overcome by automatically adjusting the gain of the auto alarm in accordance with the prevailing average interference level, by means of a circuit now to be described.

The same voltage (negative in response to the presence of interference or signal) applied to the control grid of tube 13, is also applied through a resistor 46 to the control grid of a pentode vacuum tube 47 connected as an amplifier. In the "no-signal, no-interference" condition in the receiver, tube 47, like tube 13, draws sufficient anode current to energize an "AGC" relay 48 to the position illustrated. The coil of the "AGC" relay 48 is connected into the anode circuit of amplifier tube 47. First, we will consider what occurs when interference is received. The receipt of interference, as well as the receipt of a signal, results in the application of a negative voltage to the control grid of tube 47, deenergizing relay 48, signal relay 15 also being deenergized under these conditions, as previously described.

When relay 48 is deenergized, its lower pair of contacts close and its upper pair of contacts open. A circuit is then completed from the negative source —20 v. through a resistor 49, the closed lower contacts of the "AGC" relay 48, the normally-closed contacts of a relay 50, and a resistor 51, to the grid of a triode electron discharge device structure 52 connected as an AGC cathode follower. The AGC line 5, which is utilized to automatically adjust the gain of stages 2, 3 and 4, is connected to the cathode of structure 52. The application of the negative voltage to the grid of structure 52 charges a capacitor 56 and biases this structure further and the voltage on the AGC line 5 moves in a negative direction, thus tending to decrease the gain in stages 2, 3 and 4 and decreasing the sensitivity of the receiver. However, this decrease of gain takes place at a rather slow rate, amounting to only about one db in four seconds, because resistor 49 has a high value of resistance, 40 megohms for example, and the capacitor 56 (which is connected between the grid of structure 52 and the negative terminal of the source) has a rather high capacitance, 20 mfd. for example. This slow rate reduction of gain is unimportant with respect to reducing the receiver sensitivity.

After four seconds of interference, the first selector relay 21 is energized, as previously described, causing the stepping relay 23 to step to its first position in which movable contact 54 engages both fixed arcuate contact 53 and fixed contact 55. This in turn energizes relay 50 through a circuit which may be traced as follows: —6 v. supply lead, coil of relay 50 (Fig. 1*a*), contacts 53, 54 and 55 (Fig. 1*b*), +6 v. supply lead. The contacts of relay 50 are then opened to open the circuit to the grid of the AGC tube 52, thus removing the negative source —20 v. from the circuit and causing the voltage on the AGC line 5 to remain constant, as determined by the charge on capacitor 56. After two more seconds (a total time of six seconds), the second selector relay 25 is energized, as previously described, to energize the restore coil 32 of stepping relay 23. The coil of a relay 57 (Fig. 1*a*) is connected directly across restore coil 32 (Fig. 1*b*), so that relay 57 is also energized at this time, to close its two pairs of contacts. Closing of the lower pair of contacts of relay 57 shorts out the large resistor 49, while closing of the upper pair of contacts of this relay completes a circuit from the negative voltage source —20 v. through the closed lower pair of contacts of relay 57, the closed lower contacts of the "AGC" relay 48, the closed upper pair of contacts of relay 57, and resistor 51, to the grid of AGC tube 52. The application of this negative voltage to the grid of structure 52 charges capacitor 56 and causes the voltage on the AGC line 5 to again move in a negative direction, this move now being very rapid because of the removal of the large resistor 49 from the circuit. In other words, the gain or sensitivity of the receiver is now rapidly decreased, at a rate of about 100 db in ten seconds.

When the gain of the receiver has been reduced to a low level, one at which the interference is no longer of sufficient strength at detector 8 to maintain tube 13 cut off, the signal relay 15 is energized, deenergizing relay 21 to restore stepping relay 23 to its start or home position. This in turn causes relay 57 to be deenergized (because of the breaking of its energization circuit at contacts 30) and relay 50 to be deenergized (because of the breaking of its energization circuit at contact 55). Relay 48 now also being energized, all circuits between the negative voltage source —20 v. and the grid of tube 52 are broken and the AGC voltage on line 5 increases due to the connection of the grid side of capacitor 56 to B— through resistor 51, the closed contacts of relay 50 and the upper pair of contacts of relay 48; capacitor 56 then begins to discharge, causing the AGC voltage to move in a positive direction. The gain of the receiver has now been automatically adjusted to the prevailing interference level.

The "AGC" relay 48 is adjusted to be more sensitive than the signal relay 15. In other words, the signal relay 15 is deenergized at aproximately 1 db higher receiver signal level than the "AGC" relay, it being remembered that these relays are both energized under "no-signal, no-interference" conditions. After the gain has been automatically reduced to the prevailing interference level, the signal relay 15 will remain inactive and the "AGC" relay 48 will be deenergized at approximately a two-second rate to increase and decrease the gain to adjust the sensitivity to the prevailing interference level. This comes about in the following way. When the gain has been reduced to a low enough level, relay 48 is energized to connect the grid side of the capacitor 56 through resistor 51 and the closed contacts of relay 50 and the upper pair of contacts of relay 48 to B—, to which the lower side of capacitor 56 is connected. Capacitor 56 then begins to discharge through resistor 51, removing some of the bias from tube 52 and causing the voltage on AGC line 5 to move in a positive direction, increasing the gain of the stages 2–4. As the gain increases, the "AGC" relay is deenergized, thus applying a negative voltage from the source —20 v. through resistor 49, the now-closed lower contacts of relay 48, the closed contacts of relay 50 and resistor 51, to the grid of the tube 52, thus charging capacitor 56 and reducing the gain of the stages 2–4. When the gain has reduced to a low enough level, the relay 48 is again energized to again connect the grid side of capacitor 56 to B—, starting

to discharge this capacitor and again causing the voltage on AGC line 5 to move in a positive direction, increasing the gain of stages 2–4. This action will be repeated as long as the interference is present and at the same level, at a rate determined by the time constant of the network including resistors 49 and 51 and capacitor 56. The signal relay 15, being less sensitive than the "AGC" relay 48, will remain inactive, and thus all the selector relays 21, 25, 33 and also the stepping relay 23 will be unaffected.

If an alarm signal now is received at a level equal to or greater than the interference, the signal relay 15 will operate, that is, it will be deenergized. This is true since under the condition of periodically increased gain brought about by the action of the "AGC" relay 48, even alarm signals of a level equal to the interference can operate relay 15. At this time, "AGC" relay 48 is also operated (deenergized) as previously described, reducing the gain 1 db in four seconds. This reduction of gain is unimportant with respect to decreasing the receiver sensitivity.

After four seconds, the first selector relay 21 is energized, stepping the relay 23 to its first position and energizing relay 50. This opens the grid circuit of the AGC tube 52, causing the voltage on the AGC line 5 to remain at a fixed level. The auto alarm receiver then operates at constant gain, since with proper alarm signals relays 25 and 57 are never energized and relay 48 remains deenergized, and the alarm bell 43 will ring after the proper number of dashes and spaces have been received to step up relay 23 to its fourth position.

If the average interference level decreases, relay 48 remains energized as illustrated and relays 57 and 50 remain unenergized as illustrated. Then, the grid side of capacitor 56 is connected to B— through the small resistor 51 (which for example may have a value of 100K). The capacitor 56 then discharges rapidly, causing the voltage on AGC line 5 to move rapidly in a positive direction, rapidly (at a rate of 100 db in ten seconds) increasing the gain of the receiver. The time constant of this discharge circuit is very fast (a 20 mfd. capacitor discharging through a 100K resistor to B—).

To recapitulate, for a received alarm signal only, the gain of the receiver will not be, for all practical purposes, reduced during the time the alarm signal is being received. This period of time is twenty seconds, and the actual gain reduction is only about 1 db. If the average interference level is increased for less than six seconds, the gain of the receiver is not appreciably reduced, since under these conditions relays 25 and 57 are not energized. The actual gain reduction is only about 1 db in six seconds. If the average interference level is increased for longer than six seconds, the gain of the receiver is decreased at the rate of about 100 db in ten seconds. Finally, if the average interference level decreases, the gain of the receiver is increased at the rate of about 100 db in ten seconds.

When instantaneous interference of large magnitude is received, the R. F. and I. F. tubes in stages 2, 3 and 4 draw grid current. The cathode follower tube 52 isolates the capacitor 56 in the RC time constant network (consisting of capacitor 56 and resistors 49 and 51) from the AGC line 5, and from the grids of the gain-controlled tubes in stages 2–4. This prevents any grid current that is drawn by these tubes from charging up the time constant capacitor 56. Thus, large instantaneous interfering signals will have no effect on the sensitivity of the receiver. Without this isolation, when large instantaneous interference is received the grid current drawn by the tubes in stages 2–4 would charge up the capacitor 56 and reduce the sensitivity of the receiver to an undesirable level.

The AGC circuit will respond to a change in interference level of over 100 db and the signal relay 15 will recognize down to 10-millisecond spaces between dashes. The AGC will respond in approximately ten seconds, when interference is reduced from 1 volt to zero, or increased from zero to 1 volt.

It has been found possible, at most interfering signal levels, to operate the alarm with an alarm signal lower in level than the interfering signal. A possible explanation for this is the additive effect of the alarm signal to the interference.

A triode electron discharge device structure 58 (which is preferably in the same envelope with structure 52, these two structures together utilizing a 6SN7 tube) is connected as a diode from the AGC line 5 to the B— supply lead. This structure 58 is a clamp tube which prevents the AGC line 5 from assuming a positive voltage. Structure 58 may be omitted if desired.

The function of tube 47 is to provide isolation of the signal and "AGC" relays 15 and 48, respectively, from each other. However, it may be possible to operate the "AGC" relay 48 in series with the signal relay 15 and adjust for the necessary delay, thus rendering tube 47 unnecessary.

In some cases, it may be desirable to reverse the polarity of operation. This means that the cathodes of the gain-controlled tubes in stages 2–4 would be operated at a positive potential, say +30 v., and their grids connected to the AGC line 5. This allows the use of a positive capacitor charging voltage of 30 v. for capacitor 56, in place of the negative supply —20 v. illustrated. This polarity reversal would be accomplished in the following manner. The B— lead would be replaced by a +30 v. supply and the —20 v. supply lead would be replaced by B—. The cathode resistor of tube 52 would be returned to B— instead of the —32 v. supply as shown. Thus, for the no-signal, no-interference position +30 volts would be applied to the grid of tube 52, thereby applying +30 volts to the AGC line 5. This would cause the tubes in stages 2–4 to be at maximum gain. In the gain decreasing position the charge on the capacitor 56 would be reduced, thus lowering the positive 30 volts applied to the AGC line 5 and thereby reducing the gain. Such an arrangement is entirely within the scope of this invention.

What is claimed is:

1. In an auto alarm receiver, an automatic gain control circuit comprising signal-responsive means operating only in response to the presence of a signal in said receiver to establish a gain-reducing circuit for said receiver, and other signal-responsive means operating only in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with the onset of said signal to establish at the end of said time interval an altered gain-reducing circuit for said receiver.

2. In an auto alarm receiver, an automatic gain control circuit comprising signal-responsive means operating only in response to the presence of a signal in said receiver to decrease the gain of said receiver at a predetermined rate for a time interval beginning with the onset of said signal, and other signal-responsive means operating only in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with said onset to decrease the gain of said receiver at a different predetermined rate, said last-named interval being at least as great as said first-named time interval and said last-mentioned decrease of gain beginning at the end of said last-mentioned time interval.

3. In an auto alarm receiver, an automatic gain control circuit comprising signal-responsive means operating only in response to the presence of a signal in said receiver to decrease the gain of said receiver at a first predetermined rate for a first time interval beginning with the onset of said signal, and other signal-responsive means operating only in response to the continued presence of

said signal in said receiver at the end of a second time interval beginning at the end of said first time interval, to decrease the gain of said receiver at a second predetermined rate which is fast compared to said first predetermined rate, said last-mentioned decrease of gain beginning at the end of said second time interval.

4. In an auto alarm receiver, an automatic gain control circuit comprising means acting in response to the presence of a signal in said receiver to establish a gain-reducing circuit for said receiver, means acting in response to the continued presence of said signal in said receiver at the end of a first time interval beginning with the onset of said signal to disable said gain-reducing circuit, and means acting in response to the continued presence of said signal in said receiver at the end of a second time interval beginning at the end of said first time interval, to establish an altered gain-reducing circuit for said receiver.

5. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, signal-responsive means operating only in response to the presence of a signal in said receiver to complete said time constant circuit from said source to said capacitor, thereby to charge said capacitor and reduce the gain of said receiver, and other signal-responsive means operating only in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with the onset of said signal, to alter at the end of said time interval the time constant of the capacitor charging circuit.

6. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, means acting in response to the presence of a signal in said receiver to complete said time constant circuit from said source to said capacitor and reduce the gain of said receiver, and means acting in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with the onset of said signal to open said time constant circuit at the end of said time interval, the total gain reduction effected during said time interval being inconsequential.

7. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, means acting in response to the presence of a signal in said receiver to complete said time constant circuit from said source to said capacitor, thereby to charge said capacitor and reduce the gain of said receiver, means acting in response to the continued presence of said signal in said receiver at the end of a first time interval beginning with the onset of said signal to open said time constant circuit, and means acting in response to the continued presence of said signal in said receiver at the end of a second time interval beginning at the end of said first time interval, to alter the time constant of the capacitor charging circuit.

8. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, a circuit for discharging said capacitor, and means acting in response to the presence of interfering signals above a predetermined level to close said time constant circuit, thereby to charge said capacitor and reduce the gain of said receiver, said means also acting in response to the resultant lower level of said interfering signals to open said time constant circuit and to close said discharging circuit, thereby to allow said capacitor to discharge and increase the gain of said receiver.

9. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a first relay having a pair of normally open contacts which are closed in response to the presence of a signal in said receiver, a second relay having a pair of normally closed contacts, a time constant charging circuit for said capacitor including resistance and both of said pairs of contacts, connected between a source of potential and said capacitor, and means for energizing said second relay to open its contacts in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with the onset of said signal.

10. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a first relay having a pair of normally open contacts which are closed in response to the presence of a signal in said receiver, a second relay having a pair of normally closed contacts, a time constant charging circuit for said capacitor including resistance and both of said pairs of contacts, connected between a source of potential and said capacitor, means for energizing said second relay to open its contacts in response to the continued presence of said signal in said receiver at the end of a first time interval beginning with the onset of said signal, a third relay having two pairs of normally open contacts, a time constant charging circuit for said capacitor including the contacts of said first relay and one pair of contacts of said third relay, connected between said source of potential and said capacitor, a circuit including the other pair of contacts of said third relay for shorting at least a portion of said resistance, and means for energizing said third relay to close both its pairs of contacts in response to the continued presence of said signal in said receiver at the end of a second time interval beginning at the end of said first time interval.

11. In an auto alarm receiver, an automatic gain control circuit comprising signal-responsive means operating only in response to the presence of a signal in said receiver to establish a gain-reducing circuit for said receiver, and other signal-responsive means operating only in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with the onset of said signal to establish at the end of said time interval an altered gain-reducing circuit for said receiver, the rate of gain reduction provided by said altered circuit being fast compared to that provided by the first-mentioned gain-reducing circuit.

12. In an auto alarm receiver, an automatic gain control circuit comprising means acting in response to the presence of a signal in said receiver to establish a gain-reducing circuit for said receiver, means acting in response to the continued presence of said signal in said receiver at the end of a first time interval beginning with the onset of said signal to disable said gain-reducing circuit, and means acting in response to the continued presence of said signal in said receiver at the end of a second time interval beginning at the end of said first time interval, to establish an altered gain-reducing circuit for said receiver, the rate of gain reduction provided by said altered circuit being fast compared to that provided by the first-mentioned gain-reducing circuit.

13. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, signal-responsive means operating only in response to the presence of a signal in said receiver to complete said time constant circuit from said source to said capacitor, thereby to charge said capacitor and reduce the gain of said re-

ceiver, and other signal-responsive means operating only in response to the continued presence of said signal in said receiver at the end of a predetermined time interval beginning with the onset of said signal, to materially reduce at the end of said time interval the time constant of the capacitor charging circuit.

14. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, means acting in response to the presence of a signal in said receiver to complete said time constant circuit from said source to said capacitor, thereby to charge said capacitor and reduce the gain of said receiver, means acting in response to the continued presence of said signal in said receiver at the end of a first time interval beginning with the onset of said signal to open said time constant circuit, and means acting in response to the continued presence of said signal in said receiver at the end of a second time interval beginning at the end of said first time interval, to materially reduce the time constant of the capacitor charging circuit, the total gain reduction effected during said first time interval being inconsequential.

15. In an auto alarm receiver, an automatic gain control circuit comprising a capacitor the charge on which determines the automatic gain control voltage supplied to said receiver, a time constant circuit including resistance for charging said capacitor from a source of potential, a circuit for discharging said capacitor, and a relay operated in response to the gain-controlled signal level in said receiver, said relay having two pairs of contacts one pair of which is in the capacitor discharging circuit and the other pair of which is in the time constant capacitor charging circuit, said relay acting in response to the presence of interfering signals above a predetermined level to close said time constant circuit, thereby to charge said capacitor and reduce the gain of said receiver and also acting in response to the resultant lower level of said interfering signals to open said time constant circuit and to close said discharging circuit, thereby to allow said capacitor to discharge and increase the gain of said receiver.

16. In an auto alarm receiver, an automatic gain control circuit comprising means acting in response to the presence of a signal in said receiver to establish a gain-reducing circuit for said receiver, said gain-reducing circuit operating during a predetermined time interval beginning with the onset of said signal to effect during said interval a total gain reduction which is inconsequential, and means acting in response to the continued presence of said signal in said receiver, at the end of said time interval, to disable said gain-reducing circuit.

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